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SMALL-SIZE SHIP-BORNE RADAR SET

Morskoy Flot, No 3,
Moscow, Mar 1955

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[Comment: Figures mentioned in text are appended.]

A navigation radar set of the "Neptun" type cannot be installed on small ships because of its bulk (total weight 700 kg, and with spare parts more than 800 kg). The new small-size navigation radar set, type "Stvor," whose total weight is 230 kg, is therefore of considerable interest. It is to be assumed that this set will find wide use on ships and river boats.

The "Stvor" radar consists of a receiver-transmitter and antenna assembly in one unit, a PPI indicator, a power-supply unit (MGL-B for a ship's voltage of 110 volts dc, and MGL-A for 220 volts), and an auxiliary assembly for checking (tuning) the set in the absence of targets. The power consumed by the station is 1.5 kw.

Figure 1 shows the block diagram of the "Stvor" radar.

The principle technical specifications of the set are as follows: wavelength, about 3.2 cm; pulse power, about 80 kw; pulse duration, 0.1 microsecond; pulse repetition rate, about 200 per second; beam width in the horizontal plane at half power, 1.7°; beam width in the vertical plane at half power, ±10°; antenna rotation rate, 24 rpm; cathode-ray tube diameter, 230 mm; type of presentation, PPI.

Range scales: scale I, 0.5 mile with range markers at intervals of 1 cable; scale II, 1.0 mile with range markers at intervals of 2 cables; scale III, 2.5 miles with range markers at intervals of 5 cables; scale IV, 10 miles with range markers at intervals of 20 cables; scale V, 25 miles with range markers at intervals of 50 cables.

The minimum range of the set is no more than 30 meters. The image can be stabilized in relation to either the ship's head or north (from the gyrocompass).

In the "Stvor" set the transmitter, the input section of the receiver, and the antenna assembly are combined into one unit (Figure 2), in which the upper part is the antenna assembly, and the lower part the receiver-transmitter.

The antenna consists of a reflector in the shape of a parabolic segment with a horn radiator located at the focus of the reflector and connected by means of a rotating waveguide coupler.

The reflector is made of sheet steel. The openings through which the radiation passes are covered with a plate of a special dielectric material.

In the lower, stationary part of the assembly is the antenna rotation drive, to whose housing the receiver-transmitter is bolted.

The receiver-transmitter is fitted with a removable corrugated-metal waterproof cover. The cables lead in through three grommets in the antenna-drive housing.

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Two Mark RK-3 coaxial cables and a Mark KNRE multiconductor cable, lead to the receiver-transmitter and antenna. Access to the terminal strip of the antenna drive is through a removable cover (Figure 3).

A second cover on the opposite side of the antenna drive allows access for setting the position of the lug which controls the contact group of the course-mark circuit and for synchronizing the rotation of the indicator deflection coil.

The set's indicator is of metal construction, consisting of a cast base and a cast upper panel joined by four vertical angle-iron struts which serve as the frame of the instrument (Figure 4). The indicator is covered from the top by a sheet-iron housing. The upper panel of the indicator contains all the controls of the set and rotating rings for determination of course angles and bearings. Set on the inside of the ring is a light filter to decrease eye fatigue after long observation of the image on the tube screen. In addition, there is a removable hood which can be placed over the screen.

Located inside the indicator is the cathode-ray tube (vertically, in the upper part), and below, on the chassis, are mounted the sweep circuit and the main intermediate-frequency amplifier and video amplifier blocks (see Figure 4).

In the lower part of the indicator are the power-supply block and the socket for plugging in the cables, which lead into the indicator from below through openings for that purpose in the bottom.

Power-supply switching and control of the whole station is performed from the indicator control panel.

The switch has three positions: "Vyklyucheno" (off); "Podgotovka" (warm-up); and "Vklyucheno" (on).

The control panel is equipped with the following control knobs: (1) "Nastroyka" (tuning) tunes the klystron in the receiver-transmitter when it is rotated; (2) "Usileniye" (gain) regulates the gain of the receiver; (3) "Yarkost'" (brightness) regulates the brightness of the image on the screen; (4) "Usileniye po BO" (gain for nearby objects) regulates the gain of the receiver for nearby objects; (5) "Diapazon mili" (mile range) is a knob which is mechanically coupled with the range-scale switch of the sweep block; (6) "Fokusirovka" (focusing) focuses the image on the screen of the tube; (7) "Osveshcheniye shkal Vkl. Vykl." (scale illumination On/Off) is a toggle switch to turn on the illumination of the scales designed for measurement of angles; (8) "Otmetki Vkl. Vykl." (markers On/Off) is a toggle switch to turn on the range markers and the luminous line for the ship's course; (9) "Lozhnoye ekho 1-P" (false echo 1-P) is a toggle switch for measuring the sequence frequency of the trigger pulses.

For stabilization of the image in respect to north, the indicator is fitted with an auxiliary selsyn which "receives" from the gyrocompass.

The auxiliary assembly is a chamber [echo box] and is used for tuning the radar in the absence of targets. This instrument is set at the same height as the antenna.

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The dimensions and weights of the "Stvor" radar are as follows:

1. Receiver-transmitter with antenna: diameter of corrugated housing, 412 mm; diameter of attachment flange, 500 mm; height, 1,013 mm; radius of overhang of antenna, 850 mm; weight, 97 kg.

2. Indicator: width, 360 mm; depth, 450 mm; height (without hood), 900 mm; weight, 70 kg.

3. Echo box; width, 270 mm; depth, 400 mm; height, 250 mm; weight, about 6 kg.

4. Power-supply unit: width, 220 mm; depth, 425 mm; height, 436 mm; weight, 49 kg.

5. Regulator box: width, 340 mm; depth, 155 mm; height, 305 mm; weight, 11 kg.

[Appended figures follow on next page.]

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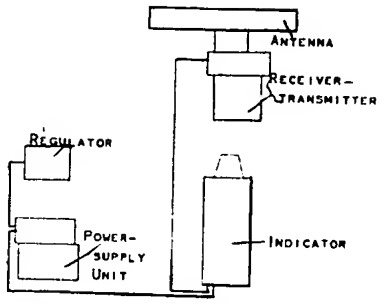

Figure 1. Block Diagram

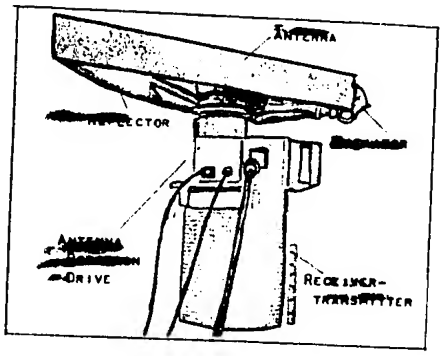

Figure 2. Transmitter-Receiver and Antenna Assembly

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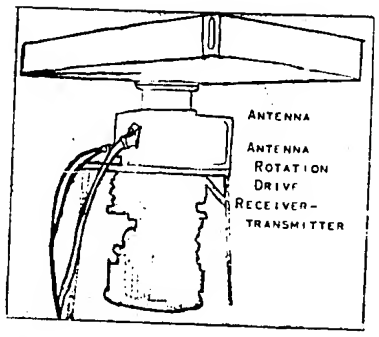

Figure 3. Transmitter-Receiver and Antenna Assembly (covers removed)

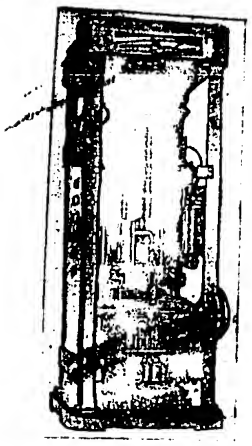

Figure 4. Indicator (cover removed)

Figure 5. Indicator

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